



BF3209

RORO SYSTEMATIC INVESTING



Factor Investing

By Albert Ricardo, Cho Yao Rong, Jeremy Ling, Lisa Wong, Loo Jia Jun & Sim Qing-Yan



Executive Summary

RORO Factor Investing is a value investment strategy that combines security selection and market timing signals. The main value that this strategy depends on is timing the positions by predicting periods of risk-on and risk-off (RORO). Everyday, we rely on the VIX index as the indicator on whether the market is being greedy (risk-on) or the market is risk-averse (risk-off). During risk on period, we screen value stocks based on factors and take positions in treasuries during risk off period.

Introduction to RORO

According to an IMF working paper published in Jan 2013 (IMF, 2013), episodes of increased global risk aversion, also known as risk-off episodes, have become more frequent and severe since 2007. During these periods, currency markets exhibit recurrent patterns, such as the Japanese yen, Swiss franc, and U.S. dollar appreciate against other G-10 and emerging market currencies. Also, according to Alessandro Beber in his paper published in Jan 2017, “risk-off” refers to a change in risk preferences and the effect on asset prices of the resulting portfolio rebalancing. He identified these episodes with switches to a polarized correlation regime of asset returns. Risk-off transitions are relatively infrequent but increasing over time. They are persistent and associated with geopolitical events. Finally, risk-off switches are unrelated to changes in macroeconomic fundamentals, volatility or correlation shocks. Risk-off switches impact broad asset classes and active trading strategies. They are also associated with significant changes in the positions of institutional investors, suggesting the return dynamics are due to price pressure induced by portfolio rebalancing.

Building on the asset pricing literature, we build our RORO model based on persistent variables that are correlated with levels of risk preferences, like the VIX index. Much like how HSBC Global Research FX Quantitative Strategy has published their own RORO strategy, our RORO model will be applied to the equities market.

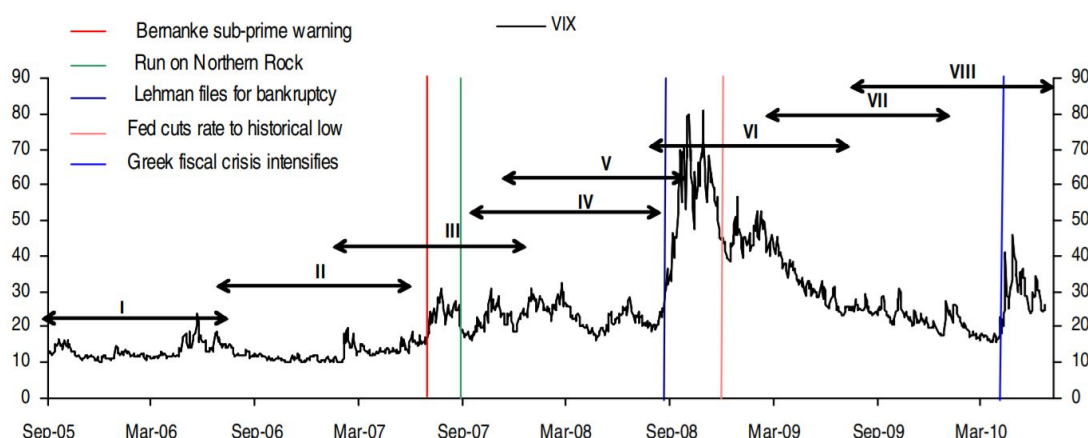


Figure 1: The VIX Index since September 2005 (Source: HSBC, Bloomberg)

Understanding the risk on – risk off paradigm is important to all financial market participants because its dominance means that portfolios may be less diversified than imagined and risks may therefore be higher than desired. It also means that the search for relative value in markets is much harder as returns are dominated by a single factor rather than by the nuances of individual market dynamics.

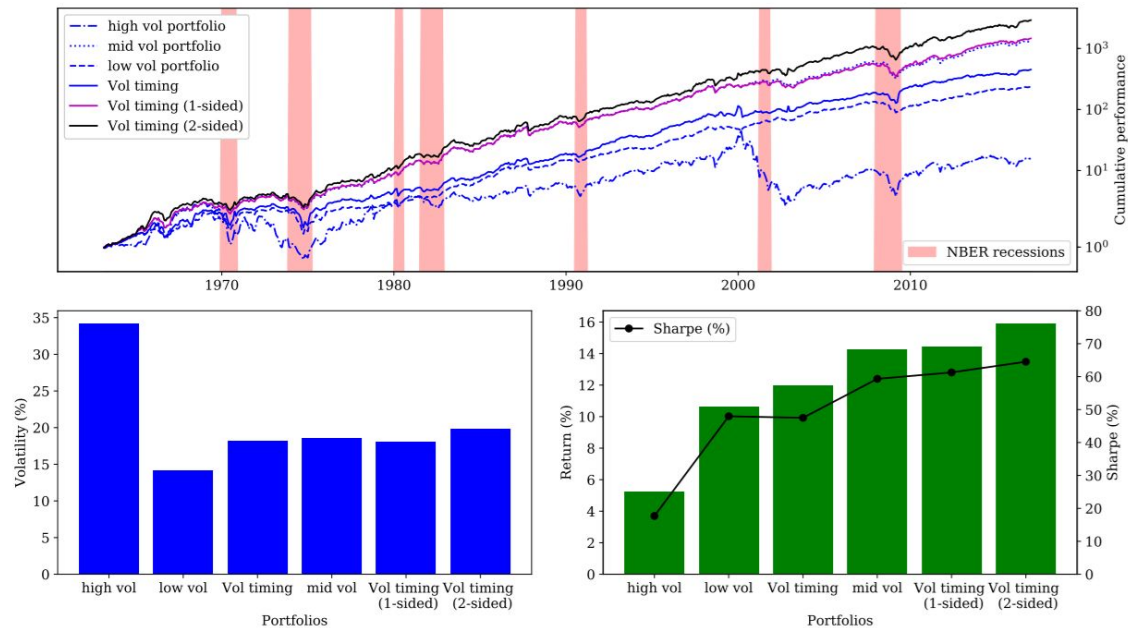


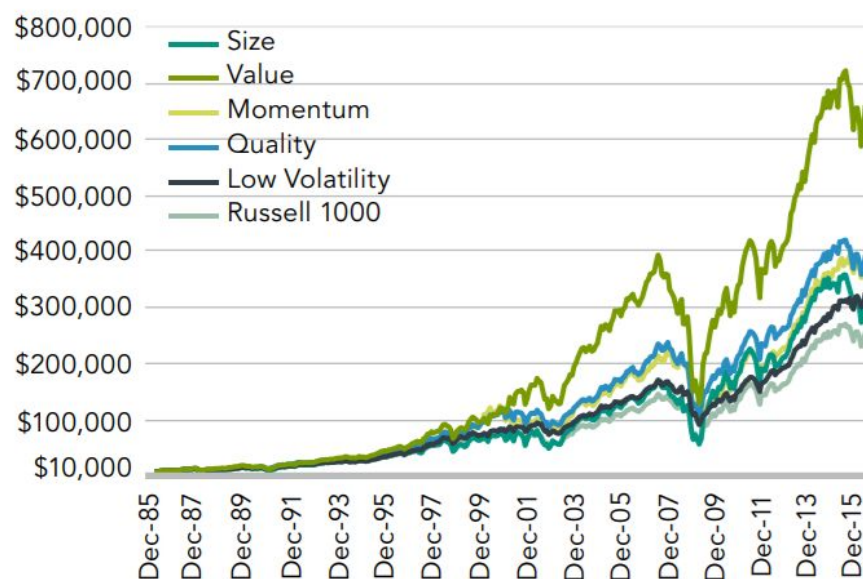
Figure 2: Performance and wealth plots of the volatility timing strategy (Source: Poh Ling Neo and Chyng Wen Tee)

Also, in the latest paper by Poh Ling Neo and Chyng Wen Tee on Volatility timing under Low-Volatility Strategy, the slope of the volatility decile portfolio's return profile contains valuable information that can be harvested to time volatility and market condition. During good market conditions, a high-volatility portfolio produces the highest return, and vice versa. Volatility timing is achieved by being aggressive during strong growth periods, while being conservative during market downturns. Superior performance is obtained, with a 30% increase in Sharpe ratio and an order of magnitude improvement on accumulated wealth.

Introduction to Factor Investing

RORO is only the first part of the strategy, the other core component is factor investing. Whether RORO is effective or not, it also depends on fundamental factor themes. Therefore, we are sticking to an age-old proven factor investing. Factors such as size, value, momentum, quality are at the core of “smart” beta strategies. These strategies have become popular among individual and institutional investors. In fact, these strategies had net inflows of nearly \$250 billion during the past five years. But investors actually have been employing factor-based techniques in some form for decades, seeking the potential enhanced risk-adjusted-return benefits of certain factor exposures.

These five factors have outperformed over time



Returns are cumulative and assume reinvestment of dividends. Past performance is no guarantee of future results. Factor definitions consistent with those shown in previous exhibits. Source: FactSet, as of Mar. 31, 2016.

Figure 3: Growth of \$10,000 investing in factor portfolios vs the broader market (Source: Factset)

Factor-based investment strategies can be compelling options because they provide investors with targeted and streamlined access to factor exposures. It's important to also note that the factor-investing universe is broad and extends beyond single-factor strategies targeting the five key factors addressed in this article. Many factor based strategies provide exposure to multiple factors within one vehicle and others provide exposure to stock characteristics that address specific investor needs or desired outcomes—such as income—but do not explicitly seek to improve returns or adjust risk in any way. The factor-investing marketplace has become more crowded, and these strategies can vary significantly in how they are constructed and in how they perform.

RORO Factor Investing Strategy

Portfolio Strategy Overview

This portfolio is a value investment strategy that combines market timing signal and security selection, aiming to outperform the market.

The value proposition is to determine the risk-on or risk-off regime by using VIX as the market timing signal, in a factor investing strategy. The investment universe for the portfolio is U.S. stocks with the following criterias:

- Market cap > \$500 million
- Primary / common shares
- Median daily dollar volume >= \$2.5 million over the trailing 200 days.

Brief overview of the strategy is as follows:

Step 1: Determine regime	VIX as indicator for risk-on or risk-off timing	
Step 2: Stock selection via factor investing approach	<u>Risk-On:</u> Invest top 5% stocks of each of the following factors: • Modified Piotroski F-Score • Advanced Momentum • Money Flow Index	<u>Risk-Off:</u> Invest 100% in the US Treasuries
Step 3: Portfolio construction	Portfolio will be: • Consist of maximum 100 stocks for each period • Rebalanced monthly or whenever VIX is triggered	

Currently, there are no existing RORO factor investing portfolios, unless they are undisclosed. BetterTrader has a RORO monitor and trade recommendation tool for investors, however it is not a systematically managed portfolio. The rest are mainly in form of research papers to determine RORO timing using indicators such as Z-Score of S&P500 returns (Lunn, J., 2015), volatility spread (Dapena, J., 2019), and VIX (Dattels, P., 2013),. However, all these are without considering factor investing.

Hence, our contributions to the existing-known systematic portfolios is by using RORO as the economic regime for factor investing. VIX is used as the indicator for RORO in this portfolio. In addition, for stock selection, Piotroski F-score is used alongside with 8-year Return On Invested Capital (ROIC) to provide a more robust fundamental analysis; while advanced momentum & money flow index are used as technical indicators.

Moreover, we included risk management elements into the portfolio strategy, to manage the portfolio better. Risk management does not mean total avoidance of risk or reduction of loss. It is about the intentional selection and sizing of exposures to improve the quality and consistency of returns. Therefore, the following constraints are added to the portfolio to manage risk:

- Leverage ≤ 1
- Number of stocks ≤ 100
- Exposure to each individual stock $\leq 1\%$.

Economic Regime & Factor Strategies

To determine the economic regime of risk-on or risk-off, we have decided to use the CBOE VIX Index as the main indicator. From the De Bock and de Carvalho Filho (2015) as well as Beber, Brandt and Cen (2017) studies, they identified risk-off episodes in the foreign exchange market using shocks to the VIX Index (a day is risk-off if VIX is 10% higher than its past 60-day average). In our portfolio, we decided to follow a similar indicator but we want to test a different set of values by considering a day is risk-off if the 10-day average VIX Index is less than 30 to determine the effects.

If the economic regime is risk-off, we will invest in US Treasuries, with the intention of not taking any risks during extreme periods. Else, we will employ our factor strategies to select for stocks.

For our factor strategies, we have chosen to use modified Piotroski F-Score, Advanced Momentum and Money Flow Index. The modified Piotroski F-Score is a composite score that assesses a company's fundamental metrics using a series of indicators:

- Net Income > 0
- Current current ratio $\geq$ previous current ratio
- Current share outstanding $\leq$ previous shares outstanding
- Operating Cash Flow > 0
- Operating Cash Flow $>$ Net Income
- Current RoA $>$ previous RoA
- Current gross margin $>$ previous gross margin
- Current Asset Turnover $>$ previous asset turnover
- Current long-term debt $\leq$ previous long-term debt
- ROIC 8-yr Growth

Next, for advanced momentum, we will long securities that are rising and sell them when they have peaked. Lastly, money flow index is a technical oscillator that uses price and volume for identifying overbought or oversold conditions in an asset. We believe that using a combination of fundamental and technical indicators will provide us alpha.

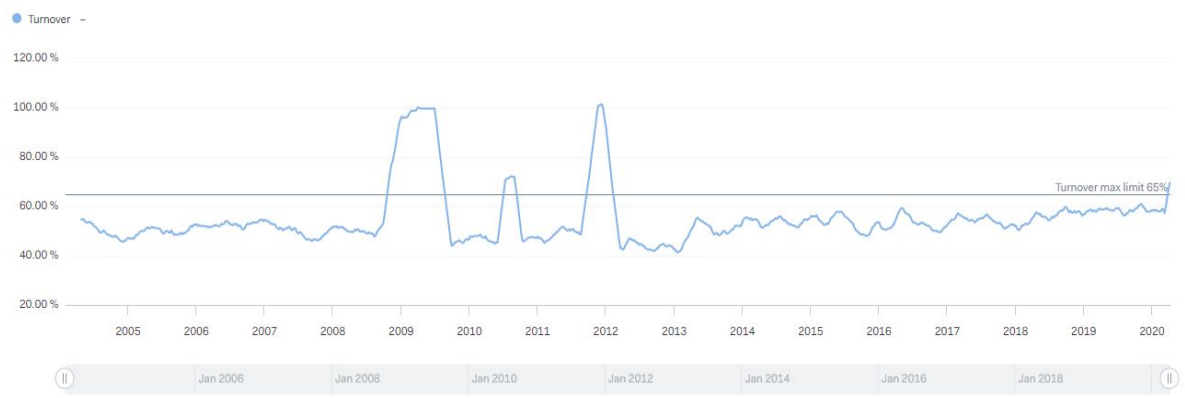
Portfolio Performance & Backtests

Figure 4 describes the backtest performance of our portfolio. Our strategy managed to earn 74% cumulative returns over a 15-year period. Our strategy managed to do well during bear periods such as the ends of 2008 and 2011.



Figure 4: Portfolio backtest

This behaviour is also supported by the turnover of our portfolio over time. Figure 5 shows the turnover percentage over the same 15-year period. From this figure, the peaks in turnover rate coincides with the major bear periods, at the ends of 2008 and 2011. This symbolizes that our portfolio strategy can indeed identify regimes where market risk is higher than the norm, and efficiently reallocate resources to switch between treasuries and our equities.



Turnover represents the rate at which assets are being bought and sold within the portfolio. The value displayed is the rolling 63-day mean turnover.

Figure 5: Turnover rate

Future Development

Our systematic portfolio management strategy is currently limited in terms of only dealing with US equities and an expansion of the coverage to include equities from ex-US markets and even fixed income instruments would be a goal for us such that a greater range of users could benefit from our portfolio management services.

In addition, we would explore using an improved combination of factors, such as a combined z-score, to determine RORO environments which represents an improvement from the knife-edge view we currently established with VIX being the gatekeeper for portfolio reallocation purposes.

Finally, and also most importantly we hope to develop a systematic management strategy which accounts for real-time, or at least closely simulated transaction costs to provide the most realistic estimates of the extent of benefits a portfolio reallocation would bring the user.

References

- Beber, A., Brandt, M. W., & Cen, J. (n.d.). Switching Risk Off: FX Correlations and Risk Premia. In *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2508651>
- Bock, R. D., De Bock, R., & de Carvalho Filho, I. (2015). The behavior of currencies during risk-off episodes. In *Journal of International Money and Finance* (Vol. 53, pp. 218–234). <https://doi.org/10.1016/j.jimonfin.2014.12.009>
- Factor Analysis with Alphalens*. (n.d.). Retrieved May 4, 2020, from <https://www.quantopian.com/lectures/factor-analysis-with-alphalens>
- Kolakowski, M. (2019, June 25). *Why “Risk-On, Risk-Off” Trades Dominate Amid Major Uncertainty*. Investopedia; Investopedia. <https://www.investopedia.com/why-risk-on-risk-off-trades-dominate-amid-major-uncertainty-4691184>
- [No title]. (n.d.-a). Retrieved May 4, 2020, from http://www.karenflower42.com/HSBC_oro1%20full%20story.pdf
- [No title]. (n.d.-b). Retrieved May 4, 2020, from <https://faculty.fuqua.duke.edu/~mbrandt/papers/working/riskoff.pdf>
- [No title]. (n.d.-c). Retrieved May 4, 2020, from https://ink.library.smu.edu.sg/cgi/viewcontent.cgi?article=7405&context=lkcsb_research
- [No title]. (n.d.-d). Retrieved May 4, 2020, from <https://www.imf.org/external/pubs/ft/wp/2013/wp1308.pdf>
- [No title]. (n.d.-e). Retrieved May 4, 2020, from https://osam.com/pdfs/whitepapers/_8_Commentary_TheEconomicCycle-AFactorInvestorsPerspective_May-2016.pdf
- [No title]. (n.d.-f). Retrieved May 4, 2020, from https://www.fidelity.com/bin-public/060_www_fidelity_com/documents/fidelity/fidelity-overview-of-factor-investing.pdf
- REF Case study search*. (n.d.-a). Retrieved May 4, 2020, from <https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=20291>